THE EARLY USE OF METALS IN INDIA AND PAKISTAN

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Introduction

Comparatively very little metal has been found in the ancient sites of northern India; and as iron is notoriously easily rusted away, it has been assumed that the scarcity of metal remains is due to the fact that the iron, which tradition infers was used in India in very early times, has all rusted away. This is an assumption which cannot readily, in our present state of knowledge, be proved or disproved; but it will be of value to show just how much is known of early metal finds and workings, and to attempt with the minimum of speculation to see how this knowledge helps with such problems as pre-Mauryan chronology, the Aryan expansion over India and Pakistan and the Dravidian question.

There is no indication that natural copper was ever used in India as a malleable form of stone which could be hammered instead of chipped or ground into shape. For there is no natural metallic copper of this kind to be found in India, and the essence of its use in this way was the fact that it could be picked up like stone in certain regions, heated and hammered into shape with a stone hammer; this stage of metal using being, as Mr. T. A. Rickard (1943) has pointed out, part of the Stone Age as opposed to the Metallurgic Age in which minerals were smelted and run into moulds. It can therefore safely be said that copper smelting was either discovered in India or it was introduced from elsewhere, but that there was no prior stage of knowledge of the metal as a malleable mineral from which implements might be hammered.

All the evidence that we have indicates early connections between India and Iran, and, with countries so adjacent, one can be expected to derive certain basic techniques from the other. In Iran the site of Tepe Sialk shows a series of occupations going back to a very remote antiquity. All the copper objects of Periods I and II were produced by being hammered out of natural copper and it is not until Period III, 4 that objects are found that were moulded from smelted copper (Ghirshman, 1939, pp. 16, 30, 53). Sialk III, 4 can be approximately dated to *c.* 3250 B.C. As there is no manufactured object of this metal found in India or Pakistan which can be dated earlier than 2800 B.C. at the earliest, there can be but little doubt that copper, along with painted pottery, came into Pakistan from the West and there is as yet no trace of its arrival in India until a much later period.

The Earliest Copper

It is difficult to assess the extent to which copper was used by the earliest dwellers in Baluchistan and Makran. Sir Aurel Stein's limited soundings in a number of mounds produced very little that can be attributed to the periods of Loralai I–III and Periano I, that is prior to 2500 B.C.[1] A copper ornamented pin from Pak in the Kolwa Valley, a single loop copper pin from Kulli, a decorated copper bracelet from Nundara and worked copper fragments from Zayak in Kharan, Siah Damb of Jhau and Moghul Ghundai in the Zhob give us but little material upon which to form any opinion except that copper was used by these peasant communities whose painted pottery is closely linked with that of early Iran. The more extensive copper finds of Mehi—a bracelet, mirrors, pins, bangles and a bowl, might date any time between 2600 and 2000 B.C. but not earlier. The many parallels between the Kulli—Mehi culture and the Harappa culture of the Indus have been clearly indicated by Professor Stuart Piggott (1946, pp. 15, 16). Nal, which bears much the same relationship in date to the Harappa culture as Kulli, has copper flat axes and knives, and the position of pottery related to this culture found in the Indus Valley, as shown by the sites of Ghazi Shah and Pandi Wahi, is contemporary with the overlap of late Amri and early Harappa (Gordon, 1947, pp. 228–30).

N. G. Majumdar's more systematic trial excavations in Sind indicated very little copper in use by the peasant communities of the Amri and allied cultures. A copper chisel was found at Othmanjo-Buthi in association with pottery that is pre-Harappa. This pottery is mostly of the straight-shouldered type with

[1] The pottery of the Zhob is described in Ross (1946) and in (Gordon, 1947, pp. 220–27). A suggested chronology of Loralai I to VI (Rana Ghundai, Sur Jangal, Dabar Kot, etc.) and Periano I to III (Periano Ghundai and Moghul Ghundai) compared with that of Indus, South Baluchistan and other sites is given in Gordon (1947, p. 239).

decoration in two colours on a buff or light red slip, linking with Ghazi Shah 312 (Majumdar, 1934, Pl. XXVII, 1), chocolate on cream, found at 37 ft. 6 in. in Pit 3 below any Harappa examples, and also with a number of the early sherds at Chauro (Majumdar, 1934, Pl. XXX, 10, 19, 20, 29, 30). A fragment of a chisel found at Arabjo Thana is also associated with early pottery and is probably equally old. The rest of the copper objects found at Jhukar, Chanhu-daro, Lohumjo-daro, Lohri, Jhangar, Ghazi Shah, Ali Murad, Dhal, Karchat and Shahjo-kotiro are of Harappa date or later.

The main sites of Harappa, Mohenjo-daro and Chanhu-daro, which have been extensively excavated, have produced a considerable diversity of objects made in copper or bronze, and it is obvious that this largely urban people with outlying agricultural settlements had a considerable degree of metallurgic knowledge. So far, we know of two large cities, Harappa and Mohenjo-daro, which are alike in having a citadel area and an adjacent town site, three small towns Chanhu-daro, Jhukar and Lohumjo-daro and a number of village sites where the existence of the main pottery types shows that the Harappa culture had made its influence felt. All of these sites are in Sind or the Punjab, the most easterly one being Kotla Nihang Khan near Rupar in East Punjab, and the most southern that of Thana Buli Khan, 60 miles north-east of Karachi.

In Baluchistan there was a Harappan outpost at Dabar Kot and some plain pottery of Harappa type reached Periano Ghundai. The few sherds from Rana Ghundai and Sur Jangal with scale pattern and the single sherd with a rosette from Moghul Ghundai are all of the period Loralai III—early Periano I and are pre-Harappa. The Harappa culture people had a trading post at Sutkagen Dor in Makran up the Persian Gulf and commercial connections with Akkadian Iraq. This important but still enigmatic civilization seems to have been that of an urban but seafaring people who exploited and exported the grain of Sind and the Punjab and who did not trouble to extend beyond the valleys of the Indus and its tributaries. It lasted from about 2600 to 1700 B.C. at Mohenjo-daro itself but seems to have been increasingly on the defensive from about 1800 B.C. onwards, at which date the Jhukar people were gradually extending their hold on Sind.

The Harappans produced a fair range of tools, weapons and ornaments in copper, bronze, silver and gold, but the types are mostly simple and undeveloped. The daggers, spearheads, flat axes and chisels seem to show little or no improvement over a period of some hundreds of years, and the craftsmen who made them apparently felt no urge to improve these objects either as tools or weapons, for at any time it is difficult to place their metal work in a higher category than Professor Childe's mode 2 (Childe, 1944, p. 10).

From what source did the Harappans derive their copper? In *Mohenjo-daro and the Indus Civilization*, Sir Edwin Pascoe suggested Baluchistan, Afghanistan and Persia as possible sources of supply and Dr. Mackay (1943) in his *Chanhu-daro Excavations* favoured Persia where both copper and tin ores are plentiful. Mr. T. H. D. Latouche in his "Annotated Index of Minerals of Economic Value" which forms part of the *Bibliography of Indian Geology* mentions ancient workings in the vicinity of the Safed Koh between Kabul and the Kurram, a copper mine at Shibar on the Ghazni-Kabul road seen by Vigne during his visit to Afghanistan, rich veins in the Shah Maksud range said to have been worked by Nadir Shah and the Kandahar Sirdars and copper mined and smelted in the territory of Luz, 24 miles south of Bela in Baluchistan. Of these, with the possible exception of the workings near the Safed Koh, it can be held as more than doubtful whether any of them were being worked earlier than the start of Muslim rule in these lands.

It is most unlikely that the Harappans obtained their copper ore from the ancient workings in the South-East Punjab, Rajputana or the Simla Hills. Though I am averse to the idea that these people drew their supplies of any article from distant places when sources existed near at hand, it seems most probable that, as tin had to be imported owing to its complete absence from India, both copper and tin were imported in the form of ingots from Persia.

The Coming of the Aryans

Rai Bahadur Ramaprasad Chanda wrote his "Survival of the Prehistoric Civilization of the Indus Valley" in 1929 and prefaced it with the words—"The relics of the prehistoric period discovered at Mohenjo-daro and Harappa leave no room for doubt that the chalcolithic civilization of the Indus Valley was something quite different from the Vedic civilization" and postulated that the latter succeeded the former. Since then nothing has been discovered which does not serve to show that his hypothesis is correct. As Professor Mortimer Wheeler has pointed out, if the Harappan citadels are not the forts which were rent by Indra "as age consumes a garment," where are they to be found? The estimated periods at which the Harappan sites came to an end—Chanhu-daro, Jhukar and Lohumjo-daro, *c.* 1800 to 1750 B.C., Harappa and Mohenjo-daro, *c.* 1700 to 1600 B.C.—agree so well with the period when the first Aryan-influenced invasions are likely to have reached

the valley of the Indus as to render any sequence of events other than the disruption of the non-Aryan Harappa culture by an invasion from the West quite unreasonable.

The evidence of the sites in Persian and Pakistani Makran and south of the Helmand in Sistan shows clearly the routes by which Iranian influences reached first of all Baluchistan and then the Indus Valley. It may reasonably be supposed that there have been more or less continuous contacts with Iran from the earliest times. It is not the purpose of this paper to argue the problem of Aryan origins. But it is taken that the evidence of history and archæology indicates a starting point from which Aryan-provoked unrest and change involved the whole area south of the Caucasus, from Anatolia on the West to Elam on the East, bringing into prominence such peoples as the Kassites, the Khurri and the Mitanni, and that it was via the Iranian plateau that the Aryan invaders of India came.

Dr. Claude Schaeffer (1948) in Appendix IV of his *Stratigraphie Comparée et Chronologie de l'Asie Occidentale* quotes Forrer as follows in the course of a chronological summary—" Vers 1770 l'armée de Nur-Dagan aurait envahi la vallée de l'Indus." This army is the *armée Manda* which Forrer has already mentioned and which is the *umman manda* of many early Assyrian, Babylonian and Hittite texts, a collective title for Aryan-speaking families or communities and associated semi-nomadic peoples who were involved in historical events in western Asia as early as the seventeenth century B.C. Mr. Sidney Smith, who has very kindly provided me with a long note on the *umman manda*, says " If the *umman manda* were mixed peoples which included a branch of the Indo-Aryan stock prior to the invasion of India by Sanskrit-speaking people, then some who would be called the *umman manda* did reach the Indus." That an actual army as we normally visualise the term under the leadership of Nur-Dagan, a somewhat legendary character, or anyone else invaded the Indus Valley about 1770 B.C. cannot be supported by any kind of evidence, but that the people who introduced the Jhukar culture invaded the Indus Valley is indisputable and that the time when this invasion took place was about 1800 B.C. is a reasonable suggestion. Were these Jhukar people wholly Indo-Aryan ?—probably not, but they certainly came from the Iranian plateau and might well be the *umman manda*.

The copper objects recovered from the graves dug into the Shahi Tump mound have been linked by Stuart Piggott with Anau III and Hissar III on the one hand and with the Jhukar settlement of Chanhu-daro II (Fig. 1, 24) on the other (Piggott, 1946, p. 23) and for the first time we see the appearance of the shaft-hole axe as opposed to the flat axes of the Harappa Culture (Stein, 1931, Pl. XIII, Sh. T. vii.1.35; Mackay, 1943, Pl. LXXII, 25). There are Jhukar elements to be found also in the Zhob particularly in the pottery of Periano III. The adze-axe which was left by some invader at Mohenjo-daro (Fig. 1, 25) is a weapon of the general period 2000–1600 B.C., and is in my opinion more likely to date towards the close of that period (Gordon, 1947, pp. 211–12, 231). Heine-Geldern has put it forward as a weapon of the Vedic Aryans, and though this is unlikely it may well be connected with the arrival of invaders who were of Indo-European speech or had leaders who spoke that tongue.

Yet other weapons of a more developed type than is generally found at any of the Indus sites are the four dirks or daggers with a pronounced midrib found at Mohenjo-daro. The two dirks, 18·5 in. (Fig. 1, 1) and 15·75 in. long respectively (Mackay, 1938, Pl. CXX, 17, Pl. CXIII, 3), were found in a context recorded as Period Late Ib, and the former at —5·5 ft. B.D. is slightly higher than the find spot of the adze-axe. The two daggers, one 11·5 in. long and the other possibly a trifle smaller (Mackay, 1938, Pls. CXX, 19, 18), were found at —6·6 ft. and —9·2 ft. B.D., which may indicate Period Late II or possibly Late Ib and Period Late III as their chronological positions.[2] In any case these weapons are all manifestly late and foreign to the Harappan repertoire. All have a moderately long tang, the two dirks having two rivet holes at the base of the blade on either side of the midrib and one of the daggers two rivet holes set one below the other on the flat tang (Fig. 1, 3).

Parallels are few and for convenience are referred to on Figs. in Schaeffer (1948). They are Gaza, tomb 1569 (Fig. 121), *c.* 2200 B.C.; Megiddo 171–2 (Fig. 145) *c.* 2000 B.C., which is the closest parallel; Byblos, building II, hoard d, Syrian Temple (Fig. 61, T) *c.* 1900 B.C. (Fig. 1, 2); Chagar Bazar, T. 131, 5 (Fig. 83) *c.* 1900–1750 B.C. Appearance of weapons of this type at Mohenjo-daro, having regard to the dating of the parallels, their position in the site and the fact that the adze-axe lies in the same general horizon, can be dated with reason to the period *c.* 1800–1750 B.C. and can be attributed to the expansion of warrior peoples which brought about a widespread distribution of improved weapon types in the period 2000–1800 B.C.

In the case of those who buried their dead in cemetery H at Harappa and who have been called by

[2] A clear explanation and diagram of the complicated system of stratigraphy used at Mohenjo-daro is given in Piggott (1947–48).

me the Ravi peoples (Gordon, 1947, p. 212, footnote 2), we have more likely candidates for the true Indo-Aryans. Either Ravi I or II (to my mind the latter) may well be the Vedic Aryans or their immediate ancestors. Unfortunately no metal finds can be associated as yet with these folk and so they do not give us any clue to the actual metallurgic knowledge of the Vedic Aryans.

It is most unlikely that the Indo-Aryans came at one time in one vast migration. The process was probably a shunting one, such as one can follow in the movements of the Huang-Nu, the Sakas and the Yueh-Chi in early historic times. There was probably an initial movement of semi-nomadic adventurers seeking new lands, following the footsteps of yet earlier Iranian peasant peoples who had found their way eastward through Sistan and Makran. These may have had with them Aryan-speaking leaders, and by various routes yet other migrants with an increasing Aryan element followed them. Why some writers should have considered an approach by Swat and Gilgit to be their most direct route or, as in the case of A. B. Keith, the Khyber to be their most natural one, is incomprehensible. A study of the map shows Kandahar to be the focal point of an approach from Iran by the normal routes either from Kirman via Sistan and Qila-i-Bist or from the North via Farah and Herat. The mountains of the Hindu Kush spread like a fan with Kabul at the hinge and to avoid an approach over a succession of mountainous ridges the routes are the Gomal, the Tochi and the Kurram valleys.

Another metal object that can be associated with the period of Aryan invasion is the lugged axe or adze found at Shalozan in the vale of Parachinar at the western end of the Kurram (Fig. 1, 23). This type of lugged axe is traceable from its area of origin in Palestine and southern Syria, where it appears not earlier than 2000 B.C., through Turang Tepe, *c.* 1800 B.C. The Kurram is mentioned in the Rig-Veda as the Krũmu and the vale of Parachinar would be an excellent resting place for a body of migrants en route for India. The close proximity of ancient copper workings in the Safed Koh, observed by Drummond in the vicinity probably of the Peiwar, is without doubt a coincidence but one that is worth noting where both ancient copper workings and artifacts are so scarce.

The weapon which has been written of as the Punjab Dagger has for that reason become a source of some misapprehension. It has been regarded as being the one object of metal that can in any way be associated with the Aryans, Vedic or otherwise, that has been found in the Punjab. Actually this dirk, which is in the National Museum of Antiquities of Scotland in Edinburgh, was brought to Mr. J. M. Douie at Fort Munro, which geographically cannot be considered as being in the Punjab, by a hill Baluch who said that he had found it in the waste land. I am indebted to Mr. Stevenson, the Keeper of the Museum, for this reference to the dirk which appeared in the *Proceedings of the Society of Antiquaries of Scotland*, Vol. XVII, p. 302. This weapon, a bronze dirk 17¾ in. long with a fan-shaped decoration on the pommel of its hilt, is of a type very similar to daggers from Luristan and Sialk VI dating to *c.* 1150 B.C. (Fig. 1, 5).

The position as regards the provenance of this dirk has not been helped by the reference to it by Professor Stuart Piggott in his book *Prehistoric India* as coming from Rajanpur. Both these places, Fort Munro and Rajanpur, are in the Dera Ghazi Khan District; but the former, which is on the road joining the Derajat to the Zhob, has not the same archæological implications as the latter, which, nine miles west of the Indus, commands the confluence of the Five Rivers and covers the gap between the Indus and the Sulaiman Range. It is difficult to associate a stray find on a scrubby hillside of the Sulaiman Range near Fort Munro with anything, whereas had it really come from the vicinity of Rajanpur about 40 miles to the south, the implications that might be drawn from this important position would be considerable. It is noticeable that the few weapons or tools that can be associated with the invaders are all types that are well known in western Asia and in particular in that region where historically we encounter peoples of Aryan speech for the first time. So far therefore we have evidence of peasant peoples who had a very meagre copper equipment, and that probably acquired by barter from similar communities closer to the source of the raw material in Iran; of the urban Harappa people who made their own copper and bronze artifacts from imported copper and tin ingots also obtained from Iran; and finally of yet other peoples from the Iranian plateau, all probably in some way connected with the Aryans, who brought their western type lugged or shaft-hole axes and mid-ribbed daggers with them.

The little that can be deduced from the historical obscurities of the Rig-Veda shows quite clearly that the Aryans, particularly the true Vedic Aryans of the Tritsu and Srnjaya clans of Madhyadesa, in whose praise and from whose view point the bulk of the "family books" of the Rig-Veda were written by the Vasisthas, the family bards of the Tritsus, were profoundly influenced by the Asuras of the Indus Valley. Ramaprasad Chanda in his memoir (1929, p. 7), puts the position very clearly—"It may not be possible for all to persuade themselves to recognise in

the hymns of books iii and vii of the Rig Veda cited above, accurate statements of fact, but they certainly preserve for us traditional accounts of the sort of events that must have happened in that remote age, and therefore the testimony is not negligible. The age to which these hymns of the Rig Veda carry was not an age of migrations, but an epoch when Arya and Dasa had already been reconciled to each other and the original opposition to the Aryan war-god Indra had been trans-replaced by philosophic doubt about his existence." Slater in his " Dravidian element in Indian culture " shows that Sakra, the chief priest of the Asuras, had for his father the rishi Bhrigu whose sons were Brahmans and priests of the Daityas, and it is clear that there were Brahmans in India before the Rig-Vedic Aryans.

Already then by the time the early hymns of the Rig-Veda were being composed the movement eastward from Sapta Sindhu had started, and the fight between the Srnjaya on the one hand and the Turvasa and the Vrichivants on the other at Hariyupiya, possibly Harappa, is already an episode in the long feud between the eastern and western clans ; a feud culminating in the Battle of Sudas and the Ten Kings which ensured the Easterners against any encroachment across the Sutlej. This feud was perpetuated, for in the Aitareya' Brahmana the Aryans of Sapta Sindhu were called Nichyas and Apachyas, low-born ill-mannered westerners, and in the Puranas, in order to glorify Madhyadesa, a bogus genealogy was produced for the Aila race so as to credit them with the origins of the whole of the western clans.

From the Vedic literature and the Puranas it is possible to deduce two facts concerning the Aryan expansion in India. Once they had secured themselves in Kurukshetra, there was a fairly rapid expansion down the Jumna-Ganges Doab, first to the area between Hastinapura and Kanayakubja and then on to that of Kausambi and Ayodhya. Secondly there was a move to the South, credited to the Yadavas, which took them to the valley of the Narbada (see Map II). This then is the next stage in the coming of the Aryans. But what archæological evidence have we to give it substance and how does it affect our investigations into the advent of metals into India and Pakistan ?

We have seen that the intruding Aryans encountered first of all the resistance of the highly organized civilization of the Indus Valley and that there are indications that they brought with them the weapons in use throughout Western Asia during the period of known Aryan expansion in those lands. Once away from the region influenced by the painted pottery peoples of Iran and the Harappa people from we know not where, the Aryans encountered the aboriginal races of India—Nishadas, Sabaras and such like who were, judging from the archæological evidence, in a neolithic stage of culture, using pottery and microliths and practising a primitive form of agriculture.

At the present time we have but little in the way of archæological evidence to fill the period after the collapse of the Harappan cities with their developed urban culture, the Jhukar people being the only ones providing sufficient material to give themselves substance as a cultural entity. The pottery types of Jhangar and Trihni are local and rather insubstantial industries, which though they do not provide sufficient material to reveal a culture, do put forward something with which to fill the large archæological void. Pottery of Trihni type seems to be present in the Zhob and to a lesser extent in Makran, and at various sites in these regions, such as Dabar Kot and Periano Ghundai, there is the possibility of recognising a series of painted pottery industries from early chalcolithic times right down to the early historic period. Even if this is so it does nothing to help us with the lack of evidence elsewhere in India and Pakistan.

So far the Punjab, either East or West, has given us only one possible relic of the early Aryans—the Punjab dagger. Though burial mounds and sacrificial altars containing thousands of bricks are described in the Vedas, Brahmanas and Sutras, it is doubtful whether the more ambitious and elaborate ones were ever actually constructed, as not one single one has ever come to light. There must be relics of the early Aryans somewhere but they have proved very elusive.

The archæological picture is not however a complete blank, for not only can it be postulated that once outside the influence of the Harappa Culture the Aryans met with aboriginals in a neolithic stage of culture, but there were also those peoples who used pointed-butt stone axes and square-shouldered tanged stone adzes. These latter may possibly be copies of metal types, but there is no evidence for it in India.[3] They came from the East where they are comparatively plentiful, and found their way into Eastern India where they have been found as far south as the lower reaches of the Godavari. The pointed-butt axes had a much greater distribution, west to Burj Hama and Nunar in the Vale of Kashmir and south to Aduturai near Kumbakonam in Tanjore.

This pointed-butt stone axe people may have occupied the Jumna-Ganges Doab from early in the second millenium B.C. and spread slowly south where

[3] The shouldered copper axes of Midnapore are something of this type and are in the same area, but, as the place of origin of these tanged stone adzes is in Indo-China, it is more likely that these copper tools were influenced by the stone adzes which had already arrived from the East.

we find them at Brahmagiri early in the first millenium and Aryan pressure may have resulted in the migration of some of these people about 1200 B.C., which might account for their settlement at Burj Hama and Nunar in the comparative security of the remote Vale of Kashmir sometime about the end of the second millenium. The stone axe people, from the evidence of Brahmagiri, had a chalcolithic culture, which with its few copper objects and its parallel-sided ribbon flake blades argues for some contact with the people of the Indus Valley.

Copper appears at many sites in the upper Jumna-Ganges Doab, the most common finds being copper flat axes and barbed spearheads, neither of which are characteristically Aryan. The flat axes could and probably did derive from those of the Harappa Culture, but they are for the most part associated with later weapon types, and not one of them has as yet been found in the Punjab outside a Harappan site.

The greater number of the copper axes found outside the Indus area are thick sectioned with a narrow butt and a wide blade. This type of axe is most uncommon in Harappa Culture levels, where they are usually found with nearly parallel sides and a thinner section. It is interesting that of the material published from all sites, the nearest approach to the axes of the United Provinces and Bihar is the one found at Chanhu-daro (Mackay, 1943, Pls. LXX, 30, LXXVI, 4). It and the object described as a kohl-jar by Mackay and subsequently shown by Stuart Piggott (1947–48) to be a mace-head, were both found in loc. 201, Sq. 9/E, the axe at + 11·2 ft. and the mace-head at + 13·1 ft. In the general vicinity of these objects there were considerable remains of Jhukar occupation, including a typical Jhukar pin in room 162 (Mackay, 1943, p. 31). The mace-head is almost certainly part of the equipment of the Jhukar people and the axe (Fig. 1, 19) appears to be late Harappa I, and it is unlikely that they date far apart, if one discounts Mackay's theory that the site was deserted for about five hundred years.

The barbed spear or harpoon heads are of two types which are illustrated on Fig. 1. The commonest, recorded as the Bithur type, is the one having a large barbed spear blade with generally two, but in one case three, hooked barbs on either side just below it, below these again are lugs on each side in one of which in some cases there is a hole. These spearheads are large, few are less than 12 in. long and one with three sets of hooked barbs is 15 in. (Fig. 1, 12). Those of the second type are almost certainly harpoons, having a series of four to six barbs on each side, equally spaced along the whole length of the blade, with invariably a hole in a lug just above the tang or stem. These are also quite large, the one purchased by H. Sastri at Bithur being 14 in. long. All these spearheads and harpoons are well-made weapons cast in a mould, of a relatively advanced type having a stout well-formed midrib.

There are seventeen known specimens of spearheads of Bithur type or close variants all found in the Jumna-Ganges Doab. Of these six are from Rajpur, Chandpur tehsil, Bijnor District (Smith, 1905, Pl. I, 1–6), two from Bithur (Sastri, 1915, Pls. II, 4, III, 2), one from Pariar and one from Brahmavarta Ghat both near Bithur (Smith, 1907, Pl. VI), one from Niorai, Etawah District now in the possession of the Royal Society of Antiquaries, Copenhagen, one from Etawah in the British Museum,[4] one acquired by Elliot possibly from Fatehgarh, one found in the River Tweed near Norham Castle obviously imported as a curio and lost (Smith, 1905, p. 242), one (Fig. 1, 18) in the National Museum Dublin (Smith, 1907, Pl. VII), one (Fig. 1, 14) brought to England by C. T. Tiechman (Sastri, 1915, Fig. 2) and one in the possession of Mr. Spencer Churchill. Of these the British Museum, Elliot and Norham spearheads can be said to be of bronze, the two latter having respectively a tin content of 6·74 and 7·97 per cent. Of the second harpoon-head type, three are from Bithur (Fig. 1, 15, 16) and one from Mainpuri, which latter was found in a field along with two flat axes and a set of six rings (Fig. 1, 17). No spearheads of these types with multiple barbs can be discovered as recorded from any Middle Eastern bronze age site. Superficially the second harpoon type is reminiscent of mesolithic barbed horn harpoons.

A hoard of thirteen copper swords and dirks was found near Fatehgarh, all except one having antennæ type hilts (Fig. 1, 7, 8, 10). Like nearly all other copper finds, this appears to have been unassociated with any other cultural remains. Two weapons with an identical strange projection on the tang are the Elliot bronze sword, acquired with a bronze spearhead of Bithur type possibly from Fatehgarh, and the copper sword found with a copper spearhead of Bithur type in a land-slip at Niorai, Etawah (Fig. 1, 9). Besides these an antennæ dirk of Fatehgarh type was acquired by Mr. F. O. Oertel at Bithur (Fig. 1, 6) and a copper dirk 18½ in. long with a midrib (Fig. 1, 4), very much of the style found in the Late Ib and II layers of Mohenjo-daro, was found at Manpur in the Bulandshahr District (Sastri, 1915, Pl. IV, 2).

This last find is the only early copper find in Northern India outside of the Harappa Culture sites

[4] Vincent Smith describes this spearhead as being 13 in. long and looking like bronze, but never analysed. He states that it is in the British Museum but I have not been able to trace it there.

that is apparently associated with some form of cultural monument. The dirk was found together with two copper axes in a khera or mound. No attempt seems to have been made to locate, describe or in any way investigate this khera. We do not know whether it was large or small, a village or a burial mound, nor even if mounds as such are common or rare in the vicinity of Manpur, and though there was here a real chance of making contact with those elusive Aryans, it has apparently been ignored.[5]

Copper flat axes are found in some numbers in Bihar. North of the Ranchi plateau a hoard of six copper axes and seventeen copper bar-celts were found buried together on the bank of a small river near the village of Hami and a further axe at the village of Saguna, thana Patan, both places being in the Palamau District. North-west of Ranchi a copper axe was discovered at Baragunda (Foote, 1916, Pl. 19) and no less than 27 copper axes were reported from Manbhum by the Rev. A. Campbell (1916, p. 85). These were found in the stretch of country to the south of the Barakar River from Paresnath to Pokhuria, in the Dhanbad Sub-division. South of Ranchi at Bartola, thana Bassia, a hoard of 21 copper axes was brought to light and at Dargama near Khunti another hoard of five axes (Fig. 1, 22), at Bichna also near Khunti a small copper celt of simple type was discovered at one of S. C. Roy's Asur sites (1920, Pl. XX).

In Mayurbanj State on the boarders of Bihar and Orissa, one foot below the surface of the bank of the Gulpha River, at the village of Bhagra Pir, a hoard of nine or ten strange objects came to light. They vary from an eighth to a twentieth of an inch thick, the largest is $18\frac{1}{2}$ in. by $15\frac{3}{4}$ in. and the smallest $10\frac{1}{2}$ in. by 7 in. (Anon., 1916, p. 386). Although it has been suggested that these objects were axes or hoes, possibly of a ceremonial nature, it is for consideration whether they were not in fact copper plates of the type used for inscriptions.

So far, copper finds away from those northern areas associated with the river basins of the Indus and the Ganges and their tributaries have been very few. This is partly because the sites and monuments investigated in the southern areas belong to the period when iron was in common use and partly because copper is far from common in South India. Only four sites with pre-iron copper or bronze finds are so far recorded—Jabalpur, Gungeria, Kallur and Brahmagiri.[6] Let us first examine their position on the map. Gungeria, three miles north-west of Mau in the Balaghat District, lies in the only gap in the hills, on a front of many hundred miles, through which the present light railway from Jabalpur to Gondia runs. It is tempting to see a north to south route from Kosambi passing close to the copper sites of Cherka and Malanjkhandi, which latter is itself not far to the east of Gungeria, through Jabalpur and Gungeria, then south along the basin of the Wainganga through Ramtek and the copper site of Thana Wasa and finally south again to the Kistna and so westward to Kallur and Brahmagiri where one is surrounded by the copper sites of Tathni, Machnur, Gumankonda, Harappanhalli (Harpanahalli), Belliguda, Ganipenta, Guntapalem and a site unnamed recorded by Bruce Foote in the south to north stretch of the Kistna (Maps I, II).

The Gungeria find is itself of the greatest interest. No less than 424 copper implements and 102 thin silver plates were found packed tightly together in a rectangular space 3 ft. × 3 ft. × 4 ft. There can be but little doubt that these objects were buried packed in a box (Fig. 1, 20). The 424 copper implements are axeheads and bar-celts, and the silver plates, many of which have two horn-like appendages, may well have been some form of ancient coinage.

Not one of these axes found in the Ganges valley nor in Bihar nor at Gungeria has a shaft-hole, they are all flat axes. By far the greater number of them are broad in the blade and narrow at the butt, but an axe found at Tamajuri near Sildah, Jhatibani Pargana, W. Midnapur District is of the shouldered celt type (Fig. 1, 21), and, having regard to the concentration of shouldered or tanged stone adzes in the North East, is likely to derive from them. The copper bar-celts discovered near Hami in the Palamau District and the axes from the sites in Bihar are of the same type as those found at Gungeria, and it is likely that this trader's stock[7] came from the Bihar Copper area and was concealed and lost while being transported through the dangerous forest region which cut off northern India from the South.

As regards the sources of copper, it is probable that

[5] Perhaps the most important archæological task waiting to be done is the linking of the copper types of the United Provinces with a dateable ceramic form. The field work of reconnaisance that would make this possible has yet to be carried out.

[6] No finds of copper appear to have been made in the stone axe levels of Sanganakallu, three miles north-east of Bellary, where excavations were carried out by Mr. B. Subba Rao. It is possible that copper of the chalcolithic stone axe culture will be discovered at this site (Subba Rao, 1948).

[7] Many of the axes in the Gungeria hoard are blunt and unfinished and are obviously trader's stock. Though these axes and celts are all potentially good implements of use, it is possible that axe-money may have been in use at that time and that the whole of the contents of the box was in fact forms of currency.

the country to the west of Kosambi obtained its copper at Dhanpur and Pokri in Almora, or from old mines in southern Patiala, principally at Motaka, or from ancient workings at Indawas, Khushalgarh and Pertabgarh in Alwar State, all quite close to the site of the city of Viratanagara. Bihar, where the greater part of the finds east of Kosambi is located, has important copper workings at Baragunda, Karharbari and in the Dhalbhum copper belt. Ingots of copper bloom, some unhammered, some in the process of being worked by hammering, came to light near Karharbari, one of the partially shaped specimens being described as "hammered out into two shoulders or two semi-circular recesses" (Samuells, 1871, p. 231), which sounds like a shouldered or tanged axe of Midnapur type in course of manufacture. The Rev. A. Campbell from his examination of 27 axes found in Manbhum was of opinion that the metal was run into a mould the shape of, but thicker and smaller than, the finished article, and then beaten out to the required thickness (Campbell, 1916, p. 85). It is most probable that all the early Indian flat axes of whatever date were produced by some such process.

At Kallur in the Raichur District of southern Hyderabad, three copper swords 39, 30 and 26 inches in length were found under a boulder on a rocky hillside (Fig. 1, 11). Their similarity to the Bithur dagger, sharing with it the main characteristics of a rounded midrib and short blunt antennæ, was noted by Mr. A. V. Naik. In spite of the fact that there are a number of ancient copper sites in the neighbourhood, it is probable that these swords were imports from the North, and though it is possible to claim them as weapons of the Vedic Aryans, they are likely to be late ones and may be connected with an extension of Aryan influence southward about 800 to 700 B.C. Beside these swords very little in the way of copper finds has been made in South India, the Stone-axe Culture levels at Brahmagiri producing just sufficient evidence to enable the culture to be classified as chalcolithic; apart from this, copper finds have been limited to bells, rings and bracelets found occasionally in Iron Age burials.

Geography and Chronology of Northern India

The importance of North West India is apparent from archæological research rather than from history. Hindu culture is primarily that of the Jumna-Ganges Doab, and in all the earlier literature we are constantly made aware of the importance of Kosala, Vatsa and Maghada with their capitals of Ayodhya, Kausambi and Pataliputra, the only outlying kingdom which could compete with them being Avanti with its capital Ujjayini. These kingdoms mark the spread of the early Aryans eastward down the Ganges valley and south to the Narbada.

Routes west of the Chambal through Viratanagara, Pushkara and Dasapura and east of the Betwa through Suktimati and Vidisa converged in Avanti territory at the adjacent crossings of the Narbada at Maheshwara and Mahismati.[8] There is evidence that from the earliest times the valley of the Narbada and the neighbouring region of Gujerat had been active, well inhabited areas, but these were still in a neolithic stage of culture, with primitive agriculturalists using microliths and pottery, when metal-using people came down from the north not earlier than 1000 B.C. at the very earliest. It is probable also that by *c.* 800 B.C. Aryan-led people had penetrated as far south as Paithan and colonised the region of Asmaka, and these may well have been the earliest Maharathi chieftains, but there is no real evidence for any further Aryan expansion into South India in Pre-Mauryan times (Map II).

Dating these early copper finds is in our present state of knowledge almost impossible; apart from the objects found at Harappa, Mohenjo-daro and Chanhu-daro it is difficult to hazard even a guess. None of the copper objects from the Jumna-Ganges valley nor from Bihar was found in any cultural context, nor is there any evidence to show how old the various ancient copper workings may be. The pottery used for baling out the ancient copper mines in the Dhalbhum copper belt, between Rakha Mines and Roamgarh, does not from personal observation look particularly ancient, but the local slag heaps and mine workings are all closely adjacent to microlithic sites where pointed-butt stone axes are also found (Murray, 1940).

The hammered copper axes and bar-celts do probably have their origin in the Indus Valley, and the Manpur dirk has more than a passing resemblance to the late period dirks from Mohenjo-daro. The cast spearheads and swords are however likely to be much later in date. The spearheads of the hunters attacking a rhinoceros in the painting in the Ghormangur Cave (Cockburn, 1883, Pl. VII) are without any doubt meant to represent the cast copper spearheads of Bithur type (Fig. 1, 13), but again this is likely, in view of the whole evidence of rock paintings in India, to argue for a late rather than early dating, and these cast swords and spearheads in all probability date no earlier than 800 B.C. and may well be much later.

[8] This presupposes that the present Mandhata was the ancient Mahismati, but if Maheshwar with its considerable remains on both banks of the river was Mahismati, then this was the point where the greater part of the traffic from the north crossed the Narbada in ancient times.

The Earliest Traces of Iron

The majority of the ideas that we find repeated about the early use of iron in India are wholly speculative and unsupported by any concrete evidence. As Professor Gordon Childe has pointed out—"*Ayas*, the only metal known to the Aryans in India at the time of the Rig Veda, must be copper or bronze; for instance, in RV. IX, 1, 2, *yonim ayohatam* makes sense only if translated a 'vessel of beaten copper'" (Childe, 1941). In addition however to *ayas* we get *syama ayas* in the Yajurveda and Arthvaveda, which may be iron but might well refer to bronze which is darker than copper. In any case the oft-repeated assertion that it was the Aryans who introduced iron into the Deccan is one that is unsupported by fact, there being not one single object or even fragment of iron as yet found north of the Narbada and the Mahanadi which can be referred to a date earlier than 250 B.C. Occasional finds such as the tanged fragment of iron found by Carlleyle "among some scattered stones of some old cairns on the slope of the hills near Visalpur" (Anderson, 1883, p. 143) suggest possibilities, but so far none of the famous ancient cities of the north has produced any iron of pre-Mauryan date.

Sir John Marshall stated in the *Cambridge History of India*, Vol. I, Chap. XXVI, that there is evidence to show that iron was introduced into Northwest India during the second millenium B.C. Not only is there no concrete evidence of this, but the use of iron does not seem to have been very prevalent at this early date in countries bordering on Pakistan. About 1100 B.C. the people of Sialk VI, in spite of being an organized and civilized community capable of building the fortress of the "*grand construction*," had rather more weapons of bronze than they had of iron, and though there is every reason to suppose that iron was a commonplace in the more civilized urban centres of India and Pakistan by 500 B.C., there is little to suggest that its introduction took place earlier than some time in the first half of the first millenium B.C.

Iron unlike copper is found in quantity all over India, particularly in the South, and it is unlikely therefore that iron or steel ingots were ever imported; in fact the reverse was true, and from the time anyhow of Ktesias, *c.* 400 B.C., iron and steel weapons were being exported to the Near East markets. Vast quantities of iron ore exist in the Salem District of Madras, in the Baba Budan Hills, Kadur District, Mysore and in Mayurbanj State on the borders of Bihar and Orissa, but ancient workings have been recorded in many places from Sop in Kashmir to Mangalam in Coimbatore, and it can be taken as certain that by 400 B.C. it was being widely worked, especially in the South.

Excavation at Brahmagiri in northern Mysore by Dr. R. E. M. Wheeler in 1947 showed that at about 220 B.C. a megalith-building, iron-using people invaded this area and dominated its inhabitants. These were in a chalcolithic stage of culture with ground and polished pointed-butt stone axes, and had in all probability inhabited the site since about 900 B.C., judging by any reasonable time scale of accumulated occupation debris. There is obviously no gradual cultural change from that of the people using stone axes to that of the people who constructed the megalithic tombs and had an elaborate equipment of iron tools and weapons. Furthermore the distribution of portholed megalithic tombs indicates an expansion from the South northward into the Deccan (Wheeler, 1947–48, pp. 200–2).

In his paper on the Megalithic Culture of southern India, Dr. A. Aiyappan of Madras enumerates roughly two dozen different forms of burial which can be associated with these iron-using megalith builders, and even then no account is taken of the extended and contracted burials of the Maski cemetery, which may also belong to the same people (Aiyappan, 1945, p. 38). The megalithic culture is characterised by certain ceramic forms and techniques. Of the forms, the most peculiar are large pyriform urns, three- and four-footed urns and jars and large terracotta sarcophagi, some with legs, some cylindrical and some of bath-tub shape. The important techniques are polished red and black ware and cream-painted russet-coated ware. The constant of this culture is the red and black ware, which is found somewhere with every type of burial and every other ceramic form and technique. This red and black ware stretches from the urn burial cemeteries of Adichanallur on the South, northward to Maheshwar on the north bank of the Narbada[9] and to Sisupalgarh, near Bhuvaneswar in Orissa (Map III).

The iron equipment of this people is characterised by long iron-shafted spears found in Coorg, Coimbatore (Grave No. 11, Kodidhasinur) and at Brahmagiri, iron-shafted tridents (Fig. 2, 8, 9), hoes with iron ring fastener, hoes with sides turned in to form a socket, billhooks (Fig. 2, 10, 12–14), saucer and hook lamps and iron tripods (Fig. 2, 16–18). In addition to these more peculiar objects there are swords, daggers, sickles, arrowheads, socketed spearheads and

[9] I have this on the authority of Dr. H. D. Sankalia who tells me in a private letter that red and black ware has been found in excavation at Maheshwar and on the surface at a site close to Nasik. It is very doubtful whether this indicates a penetration by the Dravidians in this area, and in any case the occurrence of this pottery in this area has yet to be properly evaluated.

flat axes.[10] There is no great range of types and there is little real indication of improvement or development. This whole complex of iron objects, ceramics, and burials, though showing a diversity of detail, is in fact held together by the interlocking occurrence of the more characteristic iron types, the red and black ware and the porthole type of megalithic tomb.

The ceramics of the urn and other South Indian burials have been dealt with comprehensively by Professor K. de B. Codrington, who is of opinion that the tholoi tombs cut out of the laterite in Malabar and the large urn burials are the oldest and that the pottery cists, tripod urns and megalithic cists in stone circles followed them and are contemporary with one another (Codrington, 1930, p. 196). This may well be so, but the distribution of certain features appears to be largely regional. The porthole stone cist has been found far to the south and this and red and black ware can be found all over peninsular India. The urn burials of Adichanallur type, however, have so far been discovered mainly in the Tinnevelly, Malabar and Coimbatore Districts, and this form of burial seems to be more general in the extreme south and west. In the same way tripod and four-footed urns are spread across the peninsula in the general latitude of Bangalore, being found in all the Coorg sites on the West, at Savandurga near Bangalore and in company with pottery cist burials on the East Coast. Somewhat to the south of this they appear at many of the Coimbatore sites, but north and south of these limits they have not so far been found. The pottery multiple-footed cists are located on the East Coast from Attan Tangal 15 miles north of Madras through Pallavaram and Perumbair in the Chingleput District to Kollur and Devanur in South Arcot, at which latter site J. H. Garstin brought to light footed pottery sarcophagi, one of them 4½ ft. long, in porthole cists (Garstin, 1876).

In addition, the Coimbatore burials have in many cases a distinctive russet-coated ware, painted round the circumference with a succession of wavy lines in cream on a red-brown slip. This ware was found by Col. W. H. Tucker at Sulur (Beck, 1930, pp. 171–2), by P. MacQueen at Rakiapalayam and by M. J. Walhouse at Nallampatti (Walhouse, 1875), all in the Coimbatore District. Similar russet-coated ware was also discovered by K. Govinda Menon at Tiruvilwamala in Cochin State in a granite dolmen (Menon, 1937), but as this is in the same general area, the distribution of this particular style of russet-coated ware is of comparatively limited extent. This painted pottery is found in some instances alongside the red and black polished ware and is often very similar in colour, having a black interior and an identical red-brown slip ; pot marks also, scratched on after firing, such as are widely found on red and black ware are present on the majority of the painted ware pots brought to light by Tucker at Sulur.[11]

This russet-coated painted ware must, as Wheeler has pointed out, have some connection with the similar ware found at many sites, which he has called Andhra Ware (Wheeler, 1947–8, p. 399) and as a coin of Eran, *c.* 250 B.C., was found in one of the Sulur graves, the Coimbatore pots must be the oldest known examples of this technique. The Coimbatore pottery of this type is possibly hand-made and not thrown on a fast wheel, but it is inadvisable to be too dogmatic about the method of manufacture of some of these wares. All the red and black and other pottery associated with the iron-using megalith culture of the South date, as far as the present evidence indicates, but little earlier than 600 B.C. at the earliest, and, in view of the advanced iron equipment of the people who made them, may well be wheel thrown.

Mr. E. H. Hunt describing the pottery found by him in megalithic cists in Hyderabad says " Some pots appear to have been hand-made, others turned on the wheel at the revolution rate of about fifty per minute " (Hunt, 1924, p. 150). Speaking of the same ware found at Brahmagiri, Mr. S. C. Chandra says " The pots are wheel turned, seemingly on a slow wheel " (Wheeler, 1947–48, p. 208). At fifty revolutions per minute a potter's wheel would not maintain its equilibrium at all and it is doubtful whether a vessel could be thrown at a slower speed than 240 revolutions a minute at the very slowest on the type of wheel used in India.

Pottery is technically either thrown on a fast wheel or worked by the potter, either moving round the vessel as it is shaped, or turning it on a piece of old pot base or on a board with a central pivot. With the fast wheel it is the fast rotation of the wheel that forms the pot and the process is entirely different from the building up of a pot by the coil method or shaping it from a clay lump by moulding or modelling. The fact that hand-made pottery when finished and especially when slipped shows no signs of having been

[10] The sickles, as shown by examples found at Adichanallur (Rea, 1915, Pl. IV, 8) and Dornakal (Hunt, 1916, Pl. XLVII) have their tang in straight prolongation to the axis of the blade and not bent back like those of Sialk VI, Chiga Kabud and the Caucasus (Fig. 2, 11, 15). From Adichanallur (Fig. 2, 1, 3) came two leaf-shaped swords, one four feet in length, which are very similar to some of the European swords of the Late Bronze Age (Rea, 1915, Pls. IV, 21, V, 1).

[11] These were observed by me on the pots which I examined at the British Museum.

built up, and that wheel-made pottery when it has been worked over to give it a rounded bottom and when it has been slipped and polished, shows no signs of the wheel, makes in the case of pots having no irregularity in their symmetry, a diagnosis of the method of their manufacture exceedingly difficult. Whorled, string-cut bases and close spin marks on the surface of the pot or on an unpolished slip or wash, applied to the pot while spinning on the wheel, are the only sure indications of the use of the fast wheel. In all recent fabrics we know the method of making because it has been seen in use, and where we call the pottery hand-made it is not because it necessarily looks hand-made but because we know it to be so.

Who were these people who arrived in South India with a full-fledged iron culture, using wheel thrown pottery and in most areas a mode of burial in megalithic cists ? In a recent article, Dr. C. von Fürer-Haimendorf has, I feel, put the matter quite clearly. He points out that the megalith builders were the dominant race in many parts of the south at the end of the first millenium, that is in Early Historic times, and that the present distribution of Dravidian languages coincides largely with that of the megalithic graves ; he then asks, very pertinently, " if the megalith builders did not speak Dravidian, what language could they have spoken ? " (Fürer-Haimendorf, 1950.)

We must recognise the probability, if not the certainty, that the Dravidians were not inhabiting northern India at the time of the Aryan invasion for, if the whole of the north had been populated to a great extent by Dravidians we should have had far greater evidence of the fact than the language of the Brahuis. If this whole iron-using population linked by similar weapons, tools and utensils though distinguished by differing burial customs were the original speakers of the Dravidian tongues, then they first encountered the Aryans on the upper Godavari at quite a late date. What language the stone axe people spoke is anyone's guess, but their remains do not indicate that type of culture usually associated with the Indo-Aryans.

The iron equipped megalith builders with their characteristic red and black ware encountered no real resistance from the people of peninsular India and the Deccan who were in a chalcolithic state of culture of rather an undeveloped type. Real Aryan influence ceased somewhere closely south-east of Paithan, and it was in this area that the northward drive of the Dravidians was checked. Tumuli with urn burials and stone circles opened by H. Rivett-Carnac at Junapani near Nagpur contained various iron objects, including some which he describes as stirrups and a snaffle (Rivett-Carnac, 1869, pp. 55–6). A stirrup-like object was found by Fürer-Haimendorf in a megalithic cist, but it does not look very convincing, and it is unlikely that any of these objects were connected with horse riding.

The spear and axe with crossband fastenings of the type discovered in the " Kuta Kallu " graves cut in the laterite of Malabar (Logan, 1906, Pl. XI) show that these are an extension of the megalithic folk northward. Similar graves reported as stone circle mounds were opened by J. J. Carey at Khaiwarra, 16 miles east of Arvi in the Wardha District. He brought to light an axe, a hook-lamp and other unspecified iron implements, also two copper bells and one gold and two copper rings (Carey, 1871, pp. 238–9).

Rivett-Carnac speaks of cist burials on the sandstone formation to the east of Nagpur, and in this direction one dolmen grave is known at Pipalgaon in the Bhandara District (*Arch. Survey India, Ann. Rep.* 1930–34, Pl. LXXVII). These would appear to mark the northern limit of this culture and be the result of a move up the Wainganga from the Godavari of a body of these Dravidians, whose further advance was checked by the central forest and the Aryans of Vidarbha and Asmaka.

Who were these Dravidians ? In the period of their movement from Brahmagiri to the outskirts of Nagpur, that is from *c.* 220 to *c.* 30 B.C. we should be able to give them a name. The only possible conclusion is that they were the early Cōlas, and that the only people strong enough to stop them were the early Satavahanas.[12] This dynasty, whose inscriptions on coins and monuments are all in Prakrit and which ultimately took its name as Andhra after occupying Andhra-desa, was one of non-Dravidian rulers with their original home in the general area of Paithan, Nasik and Akola, and it is a reasonable supposition that a confederacy of Maharathi chieftains under Satarkarni I, *c.* 40 B.C. to *c.* 16 A.D., checked the advance of the southerners and eventually exercised rule over the whole Deccan down to the Chitaldrug District.

Before 220 B.C., however, these Dravidians were firmly established in South India, though for exactly how long we have no means of telling. It is tempting to associate them with the people whose ships plied between the Indian coast and southern Arabia in the first half of the first millenium B.C., and through them

[12] The Chodas (Cōlas) are mentioned by Asoka in his Edicts as Borderers on his southern frontier, and the Sangam literature, which has a number of references to urn burial, associates pot and cist burials with the Cōla capital Puhar and with the Cōla king (Codrington, 1930, p. 194 ; Srinivasan, 1946, pp. 11–14).

in some way with the megalith builders of the West. There does not appear to be any alternative to an arrival by sea, as there is no evidence of a slow local evolution of this culture in South India.

There is no evidence either for a land approach from the North West, the few megaliths in this area, the *Mandwo* at Darapur in N. Gujerat (Watson, 1874) and a few in the vicinity of Karachi, representing the isolated tombs of these seafarers, if indeed the *Mandwo* be a tomb at all. If Codrington is right and the rock-cut tholoi and large urn burials are the earliest forms of burial used by this people, the fact that they are to be found most commonly on the west coast in Malabar, Cochin and Travancore and in the extreme south in Tinnevelly, does much to confirm the idea that these folk were invaders who came by sea and that they settled in the South-West and expanded to the North and East.

This then was one set of immigrants who, we know, did bring iron to India. There is, however, evidence of another iron-using people who came certainly as far as what is now Pakistan ; these were the folk who left their traces in their cairn burials from Hazar Mardi in the Rudbar tract of Eastern Persia to Moghul Ghundai in the Zhob. The culture of this iron-using people is characterised by cairn burial, painted pottery having a continuous volute pattern (Fig. 2, 19–24) and squat flasks having as their only opening a spout at one end. This continuous volute pattern is so uncommon in the Middle East that it has a definite value especially when observed in conjunction with the other features of cairn burial, iron objects and squat flasks. Sherds with this pattern were also found by Sir Aurel Stein at Chiga-kabud (Stein, 1940, Pl. XV, 17, 18) and at Bagh-i-Limu (in the British Museum, unpublished) in Western Iran, of these the former being associated with an iron age site which produced two iron sickles (Stein, 1940, Pl. XV, 13) having the bent back tang, of the type precisely as those found in iron and bronze in a number of the graves of Necropole B at Sialk.

The continuous line of these sites starts with Hazar Mardi in the Rudbar (Stein, 1937, Pl. XX, Haz. 58) and continues southward through Damban, Fanuch and Damba Koh in Persian Makran, then eastward to Jiwanri and Take-dap on the coast, 35 miles due west of Gwadar, then somewhat inland at Kalatuk and Zangian near Turbat and on to Nasirabad and Kasano-damb, all in the Kej valley. From there along the Kolwa valley continuing east we find spirals at Kambar Damb and Firoz Khan Damb and a horse and rider painted on a sherd at Gushanak[13] and there are cairn burials also on the coast at Gatti near Gwadar.

At Kulli there are two groups of cairn burials on the mound and spirals are found at the Spet mound of Jhau. Turning north into the Mashkai valley, both spirals and cairns are found at Shahdinazai and the latter at Gwarjak, and in Kharan spirals appear at Neghar, Taghazi Damb and Zayak, at which place there are also cairns. The regions of Khozdar and Wadh in central Jhalawān are full of sites containing pottery of this cairn burial culture, in fact this applies to the whole central valley of Jhalawān and Sarawān (Stein, 1931, for all above sites in Gedrosia). At Zayak in Kharan Stein discovered an amazing sherd (Stein, 1931, Pl. I, Z.N. 7) which, as he says, stands quite by itself, combining as it does a string ornament in relief with volutes and other designs in black and red over a light fawn ground wash. This sherd with its alternate black and red chevron pattern seems to link both Jhukar and Trihni with the cairn burial people.

Where these burial cairns have been excavated as at Damba Koh, Jiwanri, Zangian and Moghul Ghundai iron objects or fragments of iron objects have been found. The style of these cairn burials is reminiscent of Necropole B at Sialk, and the contents of some of the cairns at Moghul Ghundai are similar to those of the graves of that cemetery. These objects—a bracelet, a bronze tripod jar, small bells, thin rings, most of the arrowheads, especially a three-flanged example, similar to those found at Nad-i-Ali, and an adjustable bangle of a type unearthed at Giyan, probably of Giyan I date (Herzfeld, 1941, Fig. 264)—all seem to indicate a date in the earlier half of the first millenium B.C.

Objects have been found in the Moghul Ghundai cairns such as a bezel ring and an intaglio engraved with a man with a helmet, carrying a bow and spear and accompanied by a woman, which might possibly be late, but the pottery found in all these cairns is

[13] There is what appears to be a horse on a sherd from Shami Damb, where spirals are also found (Stein, 1931, Pl. III, Sh. D 3 and 4). It should however be borne in mind that such figures of horses and horsemen are extremely uncommon anywhere in the Middle East. The pottery of Sialk VI has both men and horses as painted decoration, but no instance of a man actually on horseback (Ghirshman, 1939, Frontis. and Pl. LXXXI). In two of the burial cairns at Zangian, horse skulls were brought to light, and it cannot be doubted that this cairn burial people kept horses and rode them. Recently however two sherds were found by Miss de Cardi at Londo, north-west of Nal, on which horses and equine unicorns are painted, both closely resembling the animals of Sialk VI (Ghirshman, 1939, Pl. LXXXIII). The whole evidence therefore seems definitely to point to connections between the people of the cairn burials of Necropole B Sialk and those of the similar burials here mentioned. (The Londo finds are referred to by the courtesy of Miss de Cardi.)

wholly unlike any found at early historic sites either in Waziristan, the North-West Frontier Province or the West Punjab.

It seems likely then that some time between 700 and 500 B.C. this iron-using people who buried their dead in cairns was spreading from the area just south of Kerman eastward through Makran into Baluchistan, and moreover that their cairns will be found throughout Las Bela into southern Sind. Apart from these two peoples, those who practised megalithic tomb burial in the South and those who practised cairn burial in the North-West, we have no material evidence yet of the use of iron by anyone in India or Pakistan prior to 250 B.C.

Conclusions

It has been shown that the use of copper was introduced from the West by the peasant communities of Amri culture type, who came into the Indus valley roughly about 2800 B.C., and succeeded a purely mesolithic people whose remains are found at such sites as Jungshahi Hill, Ganjar Takar and Jherruck. The copper equipment of these people was confined to a few pins and chisels.

We do not know whether these artifacts were made of smelted or natural copper. About 2600 B.C. we have the arrival of the Harappa Culture, probably from the sea, introduced by a people having a fairly large range of equipment in copper and bronze and a good knowledge of metallurgy. They were followed in northern India by incursions from Iran of peoples still with weapons of copper and bronze of Middle Bronze Age type, who can probably be associated with the arrival of an increasing element of those who spoke an Aryan language. Copper tools and weapons are found in many places in northern India but the use of this metal in any quantity does not seem to have penetrated into the South.

The working of gold at an early period has led some to suppose that gold working produced the art of metallurgy, and, as gold might possibly have been worked at a very early period in India, that metallurgy originated in India. Neither the archæological evidence nor the processes of gold-working bear out this idea. We do not know whence the Harappans derived their gold, but it is as likely to have come from Arabia as from anywhere in India, especially as Arabian bullion was being imported into North-West India as late as Kushan times (Warmington, 1928, p. 258). The " Old Men of Hutti " following a reef, extracted all payable quartz to a depth of 640 feet at Hutti in the Raichur District of Hyderabad. Their method of mining was to fracture the rock by fire setting and gouge out the fractured quartz with iron gouges and stone hand-hammers. Mr. Leonard Munn who had investigated the work and methods of these ancient miners very closely, and who was himself a mining engineer, reckoned that the extent of mining must have occupied many hundreds of years, and that the appalling conditions of mining by fire setting, at a great depth with no system of ventilation, presupposes slave labour (Munn, 1935).

In spite of the fact that megalithic remains lie far from any scene of mining activity (Munn, 1934), it is unlikely that any other people in South India had the organization or equipment to produce the slave (?) labourers or their tools. Considerable pottery remains of the megalithic people at Maski and Kallur show that they had settlements in the vicinity of Hutti, and it is unfortunate that we have no description of the sherds found in the ten feet of broken baling pots dumped in a shaft at Hutti.

All the outcrops of gold-bearing quartz in Mysore were worked out in ancient times and here again there are sufficient remains of the megalithic people in the general vicinity to suggest that they were responsible, and should by any chance these people have come originally from South Arabia, it would account for their knowledge of extracting gold. Other ancient sources of gold were the Dardic " Ant gold " and the alluvial gold of Bihar, which last was in all probability the oldest source of gold in India.

There is no material evidence of any kind that would take the introduction of iron either in India or Pakistan back earlier than the start of the first millenium B.C., and it would appear likely that this event occurred sometime between 700 and 600 B.C., though such hazarding of a date is purely speculative and so far has little or no backing of real evidence. Iron was introduced into the South by people who cannot well be other than the Dravidians and the limiting dates of their arrival can be set very widely from 400 B.C., when they were exporting iron, back to 700 B.C., earlier than which would be too early for the style of iron objects found and the small change that can be observed in types and techniques. At much the same period another iron-using people who buried their dead in cairns, having made their way from Persia through Makran and Baluchistan, arrived certainly in the Zhob and may have found their way into Sind and the North-West Frontier Province of Pakistan.[14]

It is quite obvious that as far as India and Pakistan are concerned the period of the expansion of the use of

[14] The pottery of Sar Dheri I, dated provisionally at *c.* 300—*c.* 200 B.C., has some slight resemblance to that of the cairn burials, and it is possible that in the lower levels of the Bala Hissar, Charsadda, a link may be found.

copper and bronze and the introduction of the use of iron is that about which we have the least knowledge. In my opinion to try and solve the problem by the use of literary sources is worse than useless. There are no business documents or tribute lists of this crucial period to show that copper, bronze or iron was being manufactured in any particular part of those countries in the thousand years from 1500 to 500 B.C. Digging at a site in the upper Jumna-Ganges Doab and at the Bala Hissar, Charsadda, in the North-West Frontier Province might well produce some evidence, and somewhere on the line of the old bed of the Saraswati there should be remains of the Vedic Aryans and the peoples who strove in the Great Bharata War. Until these remains are tracked down no further progress can be made in the production of a full, continuous and valid story of the prehistory of the sub-continent.[15]

[15] This paper was completed before the publication of Professor Stuart Piggott's *Prehistoric India*. As was inevitable, a certain number of observations made by me, and which I felt were original, have also been made in this work, and so, though individual to me when I wrote them, have now become general; having read this excellent book I feel, however, no compulsion to alter anything that I have written.

Tables showing the correlation of burial, pottery and iron types.

TABLE I

	Types of Burial				Types of Pottery		
	Stone Cist	Urn	Pottery Sarcoph.	Tholoi	Black and Red	3 and 4 Legged Pots	Russet Coated
Adichanallur		×			×		
Devanur, S. Arcot...	PH		×				
Kollur, S. Arcot	PH				×		
Tiruvilwamala, Cochin	×				?		×
Sulur, Coimbatore	PH						PM
Karaimadai, Coim.	PH				×	×	
Karaimadai, Coim.		×			×		
Sirumagai, Coim.			Stone S.		×	×	
Sirumagai, Coim.		×			×		
Nallampatti, Coim.	PH				×	×	×
Malabar				×		×	?
Somvarpet, Coorg	PH					×	
Odugattur, N. Arcot	×				×		
Odugattur, N. Arcot		×			×	×	
Perumbair		×	×		×	×	
Savandurga, Mysore	PH				PM		
Brahmagiri	PH				PM		AW
Maski		?	×		×		AW
Raigir	×				PM		
Janampet			Stone S.		×		

PH = Portholed; Stone S. = Stone Sarcophagus; PM = Incised pot marks; AW = Russet-coated Andhra ware.

The above table gives a correlation of types of burial and pottery with reference to sites stretching from Adichanallur in the Tinnevelly District of Madras in the South to Janampet in the Warangal District of Hyderabad in the North. The designation tholoi covers all the rock-cut tombs of Kuta Kallu (umbrella stone) and cave-tomb types found in Malabar.

Persian borderland being shown on Map IV. All the sites of ancient copper mining are derived from Latouche's "Annotated Index," which from considerable enquiry appears to be the only source of collected knowledge on this subject, and are given either on this map or on Map IV, with the exception of the mines of Sungnam in Kangra, Jhari in Kulu, Harpat Nag in Kashmir and one near Solan in the Simla Hills.

TABLE II

	Iron shafted spears	Iron shafted tridents	Hoes with iron ring fastener	Bill-hooks	Saucer and Hook lamps	Iron tripods	Swords
Adichanallur		×	×		S	×	×
Karaimadai, Coimbatore	×						
Nallampatti, Coimbatore				×			
Malabar		×	×	×	H	×	×
Coorg	×						×
Shevaroy Hills			×	×			×
Odugattur, N. Arcot							×
Brahmagiri	×		×				×
Jiwarji, Hyderabad				×	H	×	
Raigir, Hyderabad		×					×
Khaiwarra, Wardha					H		
Junapani, Nagpur			×		S ?		

This table shows the more distinctive forms of iron weapons and implements as yielded by various sites and areas, again tabulated from South to North. The saucer lamp of Junapani is a doubtful identification. This and one similar from Janampet are stirrup-like objects, which, though not precluded by their date from being stirrups, do not convince one ; they appear too flimsy to support the weight of a man mounting and their appearance suggests a stirrup only by reason of the general associations of their looped shape. These tables emphasise the statement that the red and black pottery and the distinctive iron types serve to link all the forms of burial and all the other types of pottery.

NOTES ON THE DISTRIBUTION MAPS

Map I

This map shows the location of all the known copper finds in India, those of Pakistan and the Pakistan-

Harpat Nag is almost certainly Hapatnar, 13 miles north-east of Islamabad, if the co-ordinates of lat. 33° 50′, long. 75° 23′ given by Latouche are correct. The site of Hadabanatta (Adapullnata) lat. 11° 57′, long. 72° 22′ in Coimbatore is also omitted.

Map II

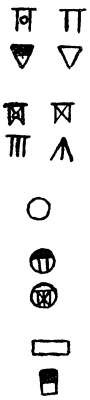
This is an attempt to embody what we know of the ancient kingdoms and their capitals, the probable line taken by the more important land routes and the limiting factor of the great Central Indian belt of dense jungle forest, which was probably much more extensive in the first millenium B.C. and the early centuries A.D. These are shown in relation to the copper mines and finds given on Map I.

Map III

A map of southern India showing the spread of the

iron-using Dravidian peoples. Only the main localities of the tomb groups are shown by symbols, as explained below, to indicate the various modes of burial and the distribution of the characteristic pottery types.

Key to Symbols on Map III



Cists with and without porthole.

Burial urns with and without red and black ware.

Cists with russet ware.

Three- and four-legged urns with and without cist.

Stone circle surrounding any of the above.

Cists with red and black ware in a circle.

Cists with legged urns and russet ware in a circle.

Pottery sarcophagi.

Sites to which red and black ware has extended.

Map IV

This shows the distribution of sites occupied by the iron-using cairn burial people, as indicated by cairns and pottery. The location of such copper workings as are known in this area and the names of places mentioned in the main text are also included.

The form lines on these maps indicate approximately the thousand foot contour.

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Description of Figures

Fig. 1.—Copper Weapons and Tools—

(1) Dirk, Mohenjo-daro ; (2) Short sword, Byblos ; (3) Dagger, Mohenjo-daro ; (4) Dirk, Manpur ; (5) Dirk, Fort Munro ; (6) Dirk, Bithur ; (7) Dirk, Fatehgarh ; (8 and 10) Swords, Fatehgarh ; (9) Sword, Niorai, Etawah ; (11) Sword, Kallur ; (12) Spearhead, Rajpur, Bijnor ; (13) Type of spearhead shown in the "Rhinoceros-hunt" painting, Ghormangur Cave, Mirzapur ; (14 and 18) Spearheads, provenance unknown ; (15 and 16) Harpoons, Bithur ; (17) Harpoon, Mainpuri ; (19) Flat axe, Chanhu-daro ; (20) Flat axe, Gungeria ; (21) Shouldered axe, Tamajuri, Midnapur ; (22) Flat axe, Dargama, Ranchi ; (23) Lugged axe, Shalozan, Kurram ; (24) Shaft-hole axe, Chanhu-daro ; (25) Adze axe, Mohenjo-daro.

Fig. 2.—Iron Weapons, Tools and Utensils, and Cairn Burial Pottery—

(1, 2, 3) Swords, Adichanallur, Tinnevelly ; (4) Sword ; and (5) Dirk, Rock-cut, "Kuta-Kallu" graves, Malabar ; (6) Sword, Karadiyur, Shevaroy Hills ; (7) Sword, Rock-cut graves, Challil Kurinyoli, Calicut ; (8) Trident, Adichanallur ; (9) Trident, Rock-cut graves, Malabar ; (10) Billhook, Kil Mondambadi, Shevaroy Hills ; (11) Sickle, Dornakal, Hyderabad ; (12) Billhook, Rock-cut graves, Malabar ; (13) Billhook, Nallampatti, Coimbatore ; (14) Billhook, Rock-cut graves, Challil Kurinyoli, Calicut ; (15) Sickle, Adichanallur ; (16) Hook lamp ; and (17) Tripod, Jiwarji, Hyderabad ; (18) Saucer lamp, Adichanallur ; (19–24) Cairn burial, volute decorated pottery from :—(19) Hazar Mardi, Rudbar ; (20) Fanuch; (21) Damba Koh ; (22) Jiwanri; (23) Kasano-damb ; (24) Spet-damb of Jhau.

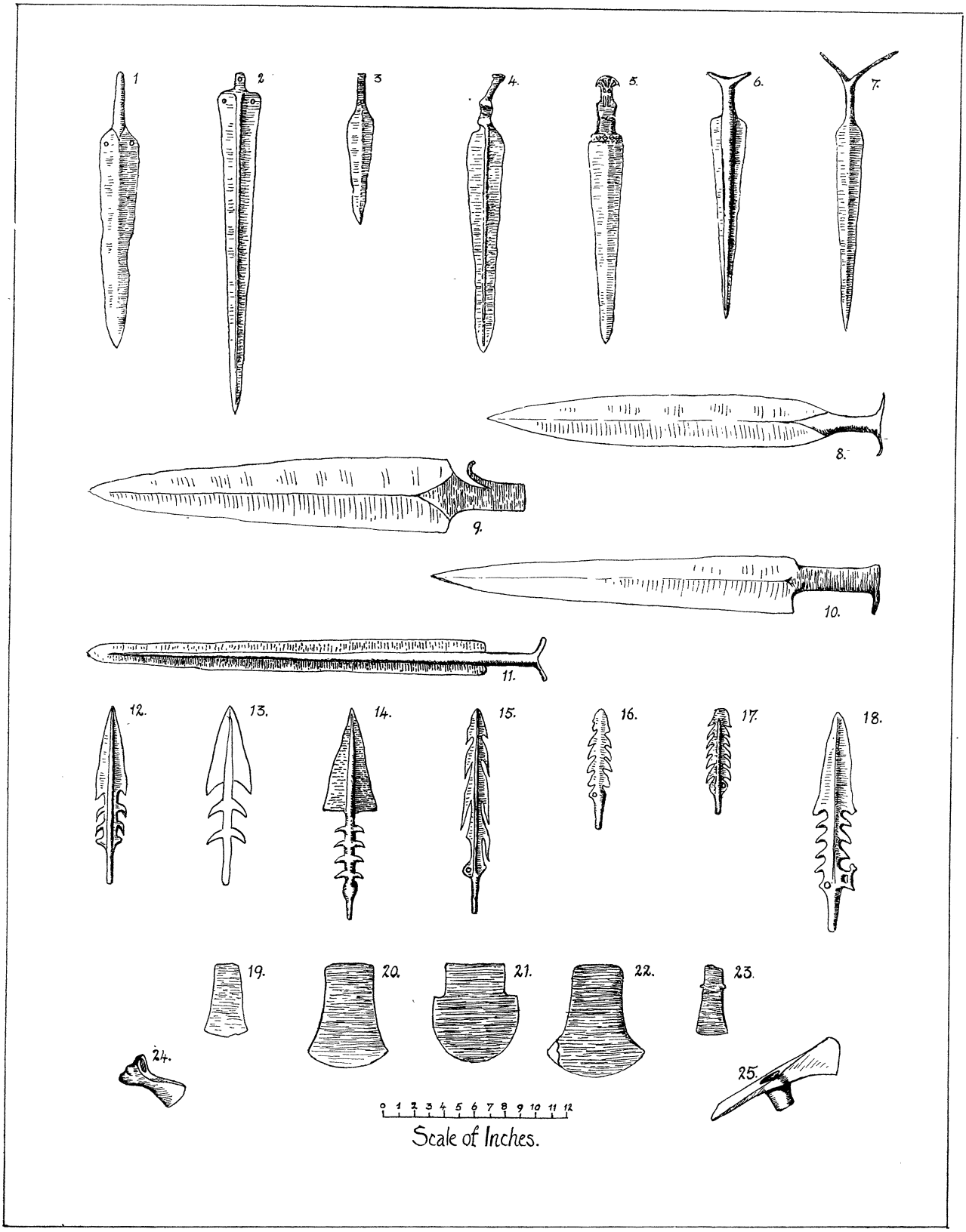


FIG. 1.—COPPER WEAPONS AND TOOLS

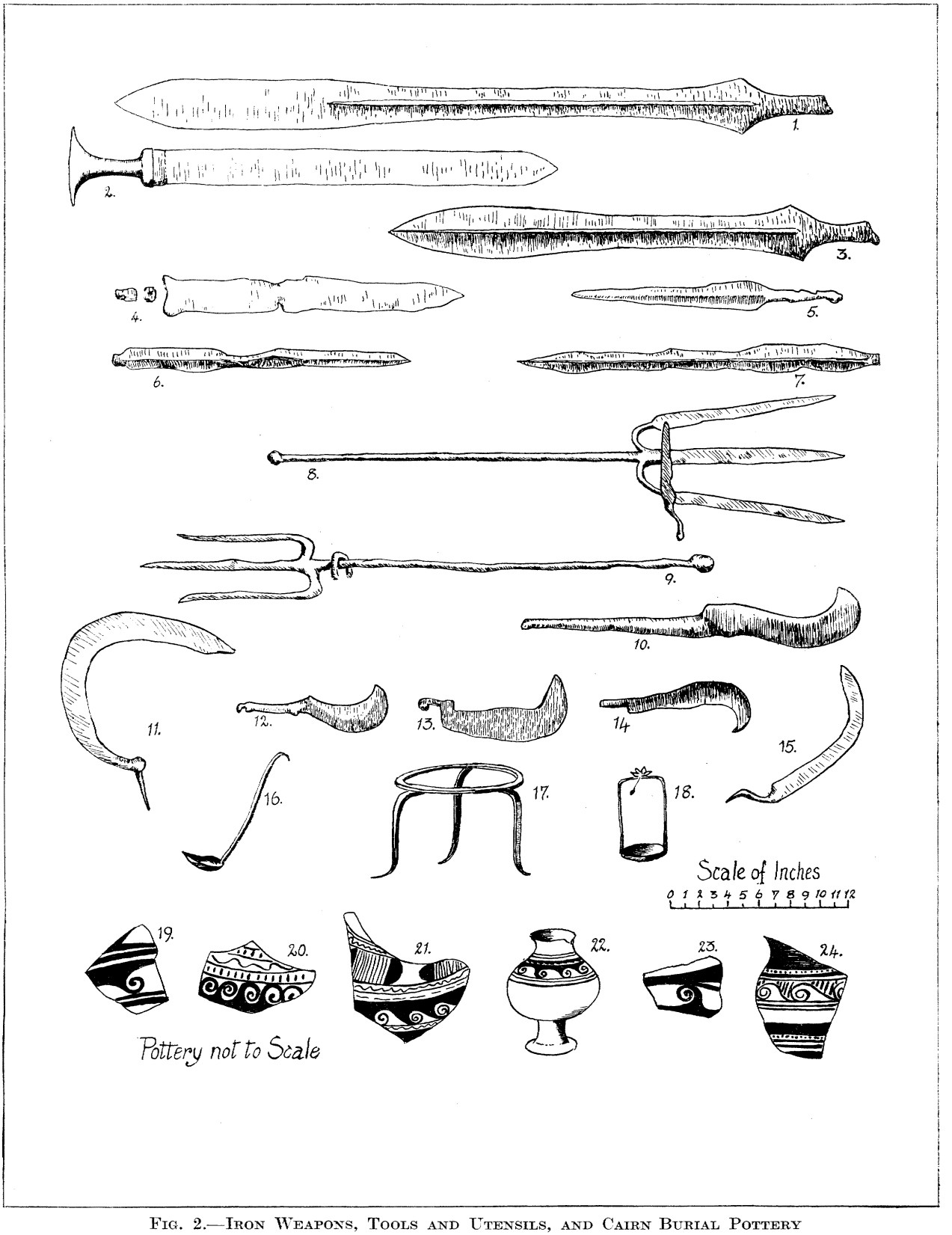
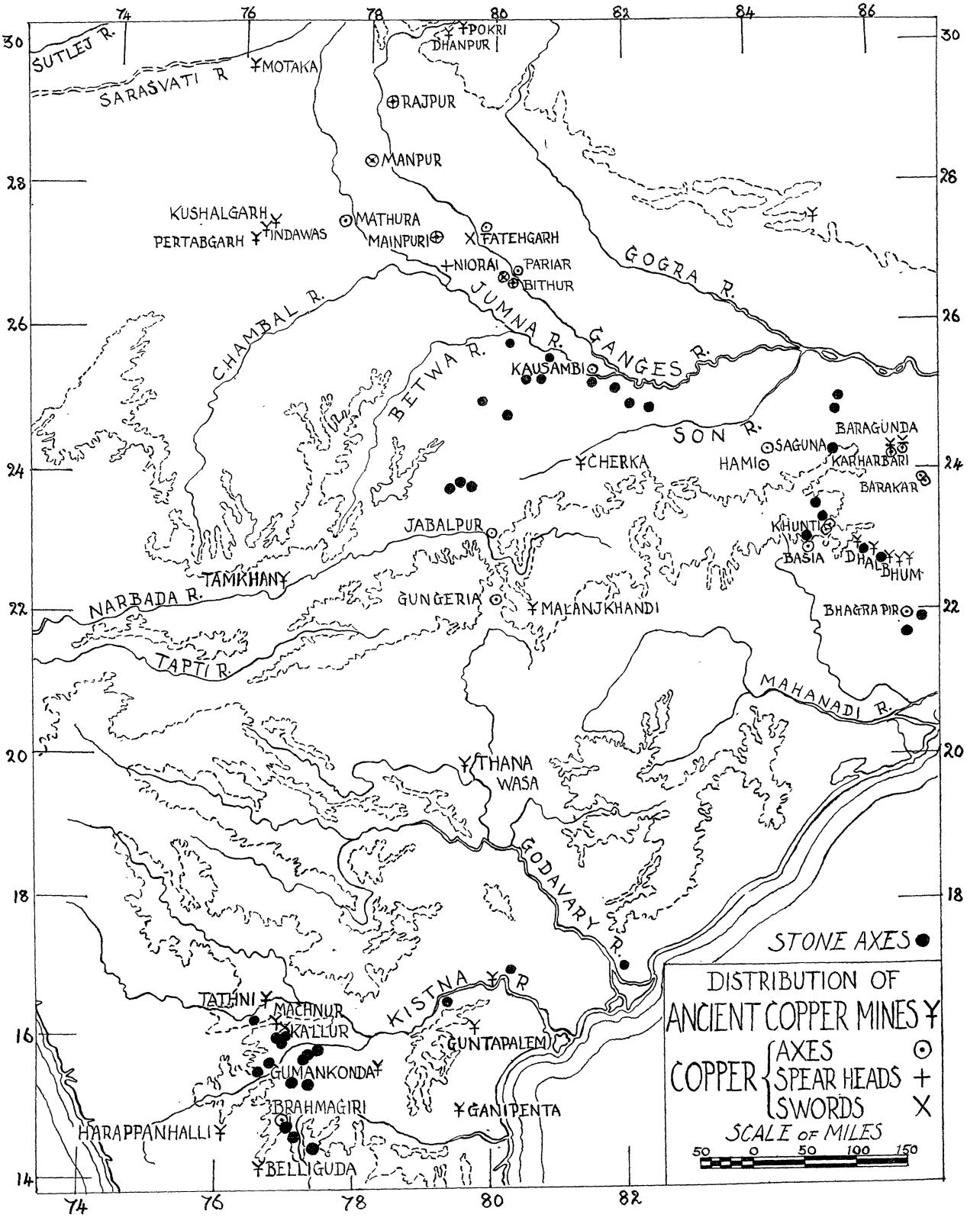
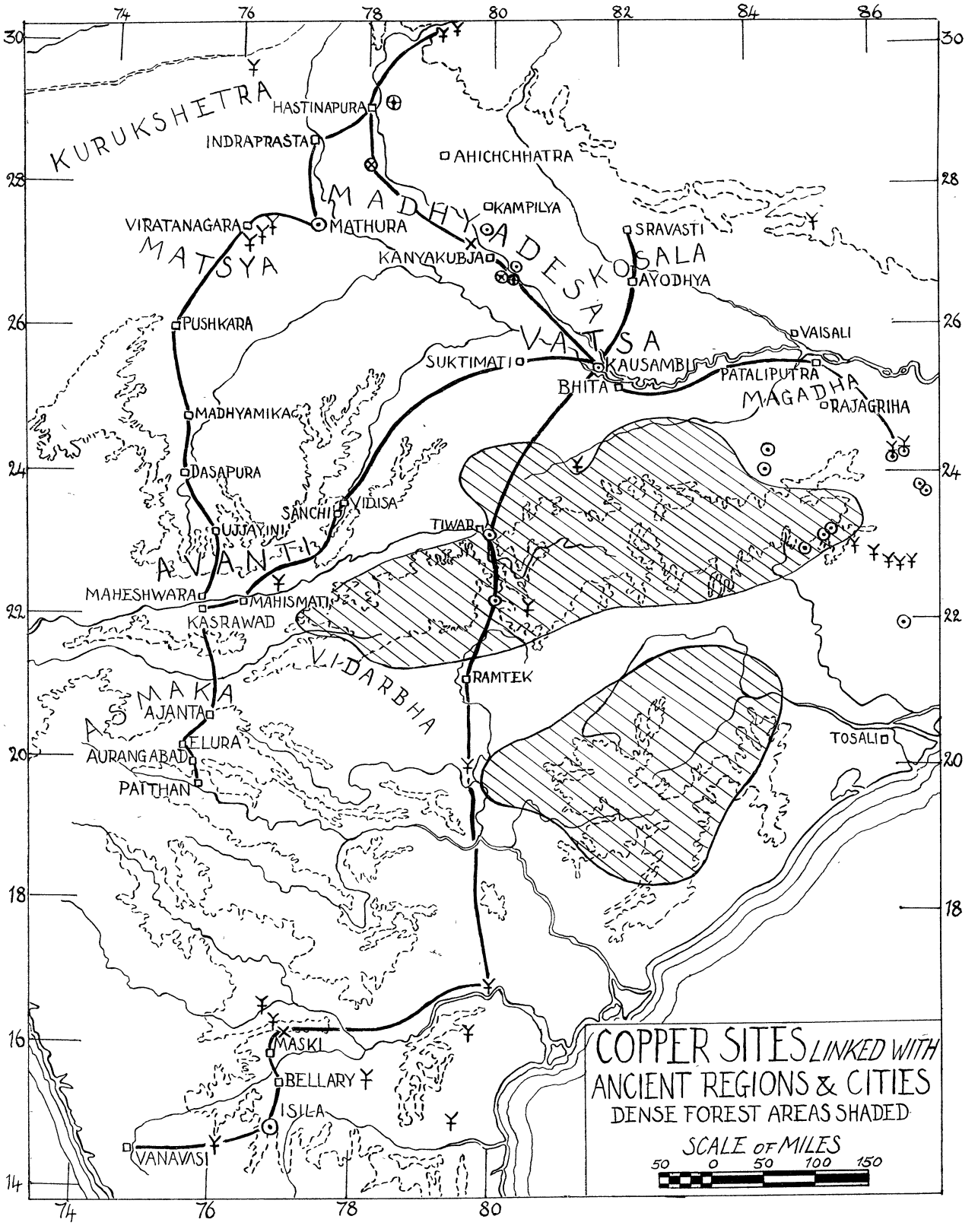


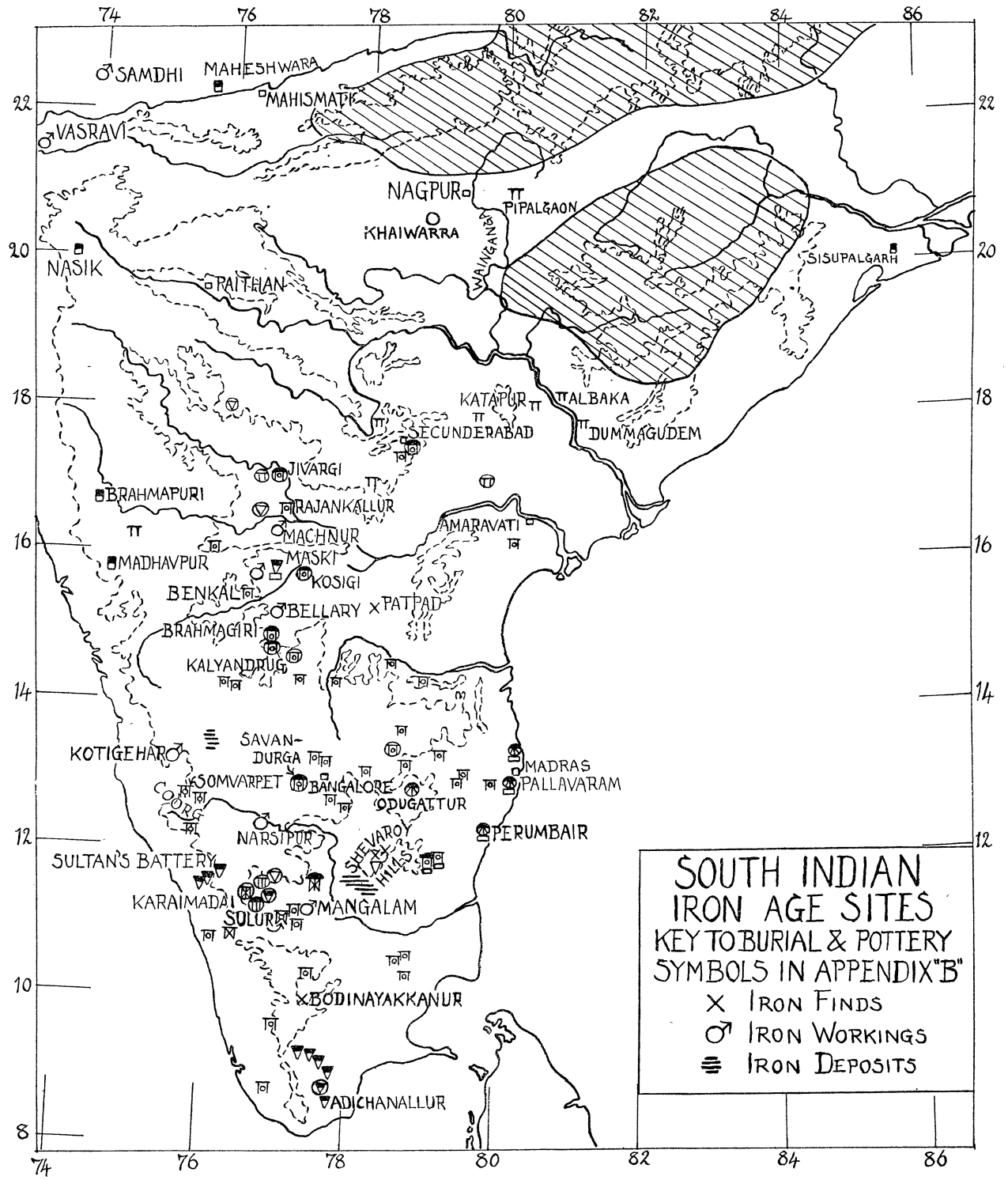
FIG. 2.—IRON WEAPONS, TOOLS AND UTENSILS, AND CAIRN BURIAL POTTERY



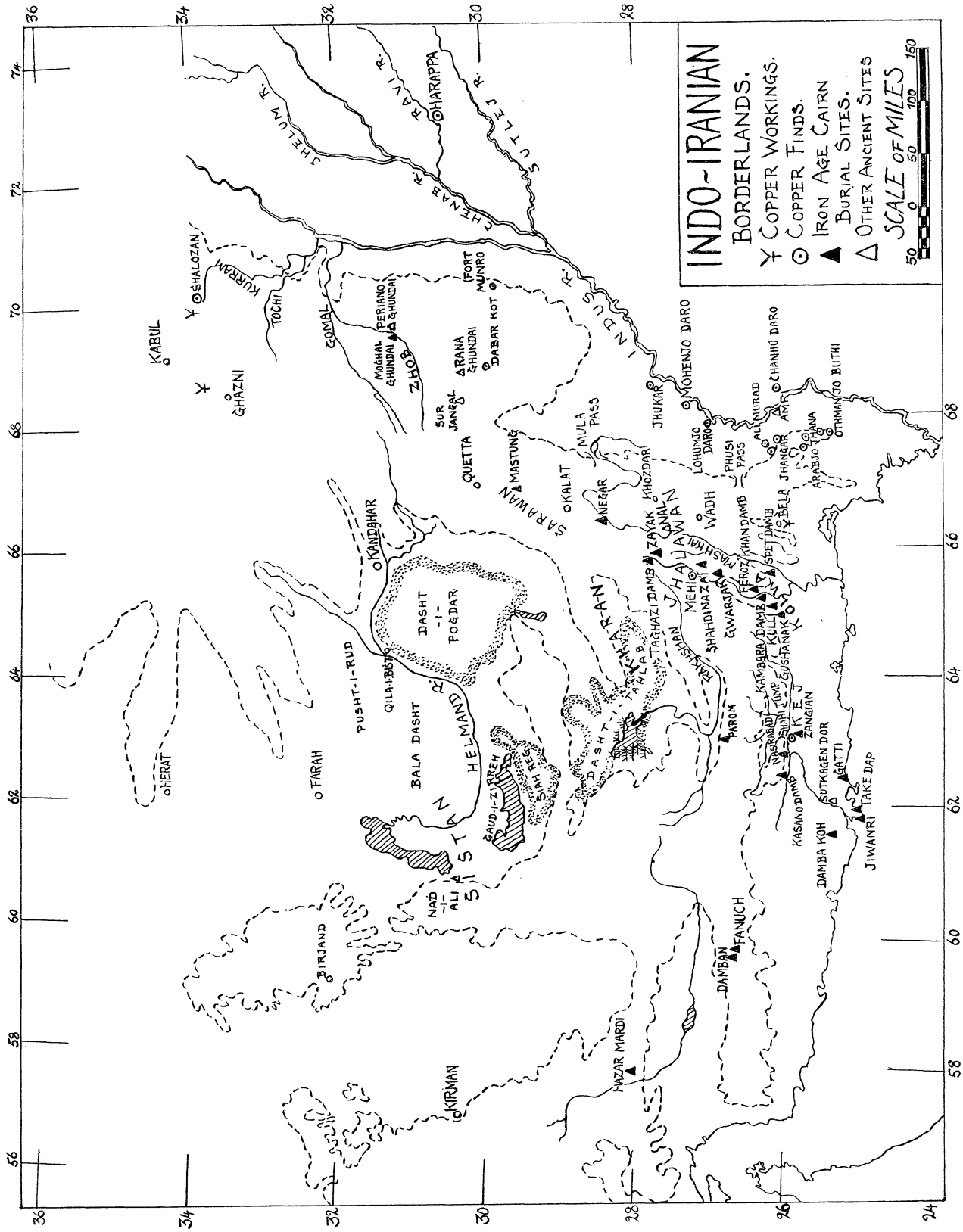
Map I



Map II.



Map. III



Map IV